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Engineering Design File

PROJECT F LE NO. ICDF-08-0001

INEEL CERCLA Disposal Facility Design Inventory

Prepared for:
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Idaho Operations Office
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Idaho National Engineering and Environmental Laboratory

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ENGINEERING DESIGN FILE

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I. Index Codes:
Building/Type _____ SSC ID _____ Site Area _____

·. Summary:

This Engineering Design File identifies a preliminary waste inventory that will be used to assist in the design basis of the INEEL CERCLA Disposal Facility (ICDF) landfill. According to the Operable Unit 3-13 Record of Decision (ROD), the ICDF landfill has an authorized capacity if 510,000 yd^3 (389,000 m^3). Approximately 483,576 yd^3 (369,720 m^3) of Idaho National Engineering and Environmental Laboratory (INEEL) Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) waste, about 95% of the authorized capacity, have been identified for disposal in the ICDF during the first 10 years of operation. This remediation waste includes 413,000 yd^3 (315,700 m^3) of predominately contaminated soils with minor debris and 70,657 yd^3 (54,021 m^3) of debris from deactivation, decontamination, and decommissioning. In addition to remediation waste, ar additional 78 yd^3 (60 m^3) of investigation-derived waste (IDW) will be generated as part of the Operable Unit 3-14 tank farm investigation and disposed in the ICDF landfill. Only low-level, mixed low-level, hazardous, and limited quantities of Toxic Substances Control Act-regulated waste will be treated and/or disposed in the ICDF. The waste consists predominately of contaminated soil with some debris.

In addition to the volume of the waste, another major factor in the design of the ICDF landfill is the inventory of organic, inorganic, and radionuclide contaminants (type, mass, and concentration). The design inventory is intended to provide a conservative estimate of the waste inventory that is expected to be'disposed in the landfill during the first 10 years of operation. To the extent analytical data were available on the contaminant concentration of the waste, those data were used to help determine the waste inventory. When analytical data were not available, contaminant concentrations for each release site were estimated based on process knowledge, releases from similar sites, scalin factors, or average contaminant concentrations from similar waste. Since much of the design inventory is conservatively estimated, it should not be used to approximate actual site conditions. It does, however, provide a conservative approximation of the wastes to be disposed in the ICDF landfill

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TABLES

ACRONYMS

CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CWID	CERCLA Waste Inventory Database
D&D&D	deactivation, decontamination, and decommissioning
DOE-ID	U.S. Department of Energy Idaho Operations Office
EDF	Engineering Design File
ICDF	INEEL CERCLA Disposal Facility
IDW	investigation-derived waste
INEEL	Idaho National Engineering and Environmental Laboratory
INTEC	Idaho Nuclear Technology and Engineering Center
ou	operable unit
PCB	polychlorinated biphenyl
RCRA	Resource Conservation and Recovery Act
RD/RA	remedial design/remedial action
ROD	Record of Decision
SSSTF	Staging, Storage, Sizing, and Treatment Facility
TSCA	Toxic Substances Control Act
UCL	upper confidence limit
WAC	Waste Acceptance Criteria
WAG	waste area group

INEEL CERCLA Disposal Facility Design Inventory

1. INTRODUCTION

The U.S. Department of Energy Idaho Operations Office (DOE-ID) authorized a remedial design/remedial action (RD/RA) for the Idaho Nuclear Technology and Engineering Center (INTEC) in accordance with the Waste Area Group (WAG) 3, Operable Unit (OU) 3-13 Record of Decision (ROD) (DOE-ID 1999). The ROD requires that some of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) remediation wastes generated within the Idaho National Engineering and Environmental Laboratory (INEEL) boundaries be removed and disposed on-Site in the INEEL CERCLA Disposal Facility (ICDF). The ICDF, which will be located southwest of INTEC and adjacent to the existing percolation ponds, will be an engineered mixed waste disposal facility meeting DOE Order 435.1, Resource Conservation and Recovery Act (RCRA) (40 CFR 264), and Toxic Substances Control Act (TSCA) polychlorinated biphenyl (PCB) landfill design and construction requirements (40 CFR 761). The ICDF will include the necessary subsystems and support facilities to provide a complete waste disposal system.

The major components of the ICDF are the disposal cells (that is, the landfill), an evaporation pond, and the Staging, Storage, Sizing, and Treatment Facility (SSSTF). The disposal cells, including a buffer zone, will cover approximately 40 acres and have a disposal capacity of about 510,000 yd^3 (389,900 m'). The SSSTF will be designed to provide centralized receiving, inspection, and treatment necessary to stage, store, and treat incoming waste from various INEEL CERCLA remediation sites prior to disposal in the ICDF or an off-Site disposal facility. The SSSTF will also have the necessary facilities to support equipment decontamination.

Currently, approximately 483,576 yd^3 (369,720 m^3) of INEEL CERCLA remediation waste, about 95% of the authorized capacity, have been identified for disposal in the ICDF during the first 10 years of operation (DOE-ID 2000). This remediation waste includes 413,000 yd^3 (315,700 m^3) of predominately contaminated soils with minor debris and 70,657 yd^3 (54,021 m^3) of debris from deactivation, decontamination, and decommissioning (D&D&D). In addition to remediation waste, an additional 78 yd^3 (60 m^3) of investigation-derived waste (IDW) will be generated as part of the OU 3-14 tank farm investigation and disposed in the ICDF landfill. Only low-level, mixed low-level, hazardous, and limited quantities of TSCA-regulated waste will be treated and/or disposed in the ICDF. The waste consists predominately of contaminated soil with some debris.

1.1 Objectives

A major factor in the design of the ICDF landfill is the inventory of organic, inorganic, and radionuclide contaminants (type, mass, and concentration) that will be disposed. This Engineering Design File (EDF) identifies a preliminary waste inventory that will be used to assist in the design basis of the ICDF landfill. It is intended to provide a conservative estimate of the waste inventory that is expected to be disposed in the landfill during the first 10 years of operation. To the extent analytical data were available on the contaminant concentration of the waste, those data were used to help determine the waste inventory. When analytical data were not available, contaminant concentrations for each release site were estimated based on process knowledge, releases from similar sites, scaling factors, or average contaminant concentrations from the waste. Since much of the design inventory is conservatively estimated, it should not be used to approximate actual site conditions. It does, however, provide an initial approximation of the wastes to be disposed in the ICDF landfill.

This design inventory, which provides a conservative estimate of the wastes to be disposed in the ICDF during the first 10 years of operation, is intended to support the following activities:

- ICDF design, via estimates of the contaminant concentration and mass of the waste
- Development of the safety analysis, via source term estimates
- Performance assessment modeling, via source term estimates
- Initial development of the ICDF Waste Acceptance Criteria (WAC), via waste estimates.

1.2 Report Organization

This EDF comprises five sections and four appendices. An introduction gives brief background about the ICDF and the CERCLA waste identified for disposal, as well as the objectives of this preliminary waste inventory (Section 1). Section 2 describes the methodology used to develop the inventory, covering cases where analytical data are available and are not available. Section *3* discusses the design inventory, including organic compounds, inorganic contaminants, and radionuclides. Tables in this section present summary information about waste volumes and about all three inventory types. Section 4 summarizes the approach and assumptions used to develop the design inventory. Section *5* contains references. Appendix A details the methods used to develop the upper confidence limits (UCLs) for the inventory. Appendices B, C, and D are detailed data tables covering each inventory type.

2. METHODOLOGY

The design inventory is primarily based on the analytical data contained in the CERCLA Waste Inventory Database (CWID), which is described in DOE-ID (2000), hereafter referred to as the CWID report. All data having detectable concentrations (i.e., all data that were not flagged with a "U" qualifier) were used in development of the design inventory. This includes data that have other data validation qualifiers, such as "R," "J," "B," etc. For radionuclides, the concentrations in the design inventory were decayed to a common date of January 1,2002.

For the sites having detectable contamination based on analytical data, either the maximum concentration or the 95% UCL concentration was used for the design inventory. The 95% UCL concentration was selected if the following two conditions were satisfied: First, a minimum of eight detectable concentrations was available and, second, the 95% UCL concentration was less than the maximum concentration. If either of these conditions were not satisfied, then the maximum concentration was used for the design inventory. The methodology used to calculate the 95% UCL concentrations is provided in Appendix A.

If analytical data were not available for a given release site, but the contaminant may be present based on process knowledge, the concentration was estimated using data from the CWID report. The estimated concentrations were based on the weighted average of the mean concentrations from those release sites where the contaminant was detected. The weighted average concentrations were determined using the following equation:

$$C_{WA} = \frac{\sum_o^t C_o X_o + C_1 X_1 + ... C_i X_i}{\sum_o^t X_o + X_1 + ... X_i}$$

where

CWA = concentration, weighted average

C = concentration

X = contaminated volume.

Importantly, the mean concentrations provided in the summary tables of the CWID report were calculated using only the analytical results where there were detectable concentrations. In other words, the nondetectable results were not used in calculating the mean concentrations. This approach provides a conservative estimate of the mean concentration (i.e., biased high).

Finally, additional data for some of the release sites were identified that are not currently in the CWID. If sources of information were used other than CWID, the source of the data is referenced in the associated summary table.

3. DESIGN INVENTORY

The design inventory includes only waste from the remediation sites that have been identified in the CWID report for disposal in the ICDF landfill. A total of 483,576 yd^3 (369,720 m^3) of contaminated soil and debris has been identified from 35 release sites for disposal in the ICDF landfill during the first 10 years of operation (Table 3-1). In addition to the waste from these sites, 78 yd^3 (60 m^3) of IDW from the OU 3-14 tank farm investigation and 70,657 yd^3 (54,021 m^3) of debris from D&D&D are expected to be generated and disposed in the ICDF landfill. This total volume represents approximately 95% of the 510,000-yd^3 (389,900-m^3) authorized capacity identified in the OU 3-13 ROD for the ICDF landfill.

3.1 Organic Compounds

The organic compounds expected to be present in the waste disposed in the ICDF landfill were identified from Table 5-3, Summary table of organic contaminant concentrations, in the CWID report. This table represents the complete list of organic compounds that have been detected from any of the release sites destined for disposal in the ICDF landfill. Since the analytical methods are typically selected based on process knowledge from a given release site, this list of organic compounds is a reasonable estimate of the organic compounds that may be present in the waste to be disposed in the ICDF landfill.

The organic compounds expected to be in the waste are listed in Table 3-2. For each compound, the estimated volume of contaminated soil (in cubic meters) and the total contaminant mass (in kilograms) for that volume are also provided.

More details on the organic compounds on a site-by-site basis are given in Appendix B. Site-specific details concerning organic contaminant concentration and mass are provided in Tables B-1 and B-2, respectively. In Appendix B, when analytical data are available for a given contaminant, either the maximum concentration (identified in the CWID report) or the 95% UCL concentration (if greater than seven detectable measurements are available) was included in the design inventory for that contaminant. The sites and associated organic contaminants having sufficient data to calculate the 95% UCL concentration are identified in Table B-3. If an organic compound was analyzed, but not detected at a given release site, the concentration was identified as "0" in the design inventory. If the organic compound was not expected to be present at a given release site based on process knowledge and analytical data are not available, then the cell was not shaded and no concentration data provided. Sites where analytical data are available, either in the CWID or a referenced document, are shaded blue in Tables B-1 and B-2.

Table 3-1. Projected waste volumes from remediation sites for disposal in the ICDF landfill (DOE-ID 2000).

Area	Site	Projected Volume (m^3)	Area	Site	Projected Volume (m^3)
WAG 1	TSF-03	821	WAG 3	CPP-55	283
WAG 1	WRRTF-01	15,348	WAG 3	CPP-67	75,889
WAG 1	TSF-06	6,255	WAG 3	CPP-92	1,047
WAG 1	TSF-09/18	3,337	WAG 3	CPP-69	47
WAG 1	TSF-26	7,811	WAG 3	CPP-93	2,039
WAG 3	CPP-1/4/5	3,256	WAG 3	CPP-97	1,147
WAG 3	CPP-03	8,364	WAG 3	CPP-98	191
WAG 3	CPP-08/9	2,370	WAG 3	CPP-99	96
WAG 3	CPP-10	323	WAG 4	CFA-04	6,338
WAG 3	CPP-11	1,140	WAG 5	ARA-01	1,821
WAG 3	CPP-13	3,075	WAG 5	AM-12	1,503
WAG 3	CPP-14	8,446	WAG 5	AM-23	35,537
WAG 3	CPP-19	2,897	WAG 5	AM-25	54
WAG 3	CPP-34	20,912	WAG 10	BORAX - 01	8,500
WAG 3	CPP-35	238	WAG 10	BORAX -08	100
WAG 3	CPP-36/91	9,571	D&D&D	WAG 1	3,984
WAG 3	CPP-37a	8,325	D&D&D	WAG 2	5,225
WAG 3	CPP-37b	78,324	D&D&D	WAG 3	29,601
WAG 3	CPP-44	68	D&D&D	WAG 5	10,668
WAG 3	CPP-48	226	D&D&D	WAG 7	4,543
				Total	369.720

Table 3-2. Contaminant summary table – organic contaminants.

Contaminant	CAS Number	Contaminated Soil (m^3)	Contaminant Mass (kg)	Maximum Concentration[a] (mg/kg)
1,1,1-Trichloroethane	71-55-6	215,247	7.4E+00	3.30E-02
1,1,2,2-Tetrachloroethane	79-34-5	7,811	2.3E-02	2.00E-03
1,1,2-Trichloroethane	76-13-1	8,494	1.1E-01	9.00E-03
1,1-Dichloroethane	75-34-3	8,494	1.1E+00	8.70E-02
1,1-Dichloroethene	75-35-4	8,494	7.0E-01	5.50E-02
1,2,4-Trichlorobenzene	120-82-1	7,811	5.4E+00	4.60E-01
1,2-Dichlorobenzene	95-50-1	7,811	5.4E+00	4.60E-01
1,2-Dichloroethane	107-06-2	8,494	2.5E-03	2.00E-04
1,2-Dichloroethene (total)	540-59-0	14,887	1.5E-01	1.20E-02
1,3-Dichlorobenzene	541-73-1	7,811	5.4E+00	4.60E-01
1,4-Dichlorobenzene	106-46-7	24,750	2.1E+02	1.60E+01
1,4-Dioxane	123-91-1	54	8.9E-03	1.1OE-01
2,4,5-Trichlorophenol	95-95-4	14,199	2.1E+O1	1.10E+00
2,4,6-Trichlorophenol	88-06-2	14,199	8.6E+00	4.60E-01
2,4-Dichlorophenol	120-83-2	16,305	1.0E+01	4.60E-01
2,4-Dimethylphenol	105-67-9	14,199	8.6E+00	4.60E-01
2,4-Dinitrophenol	51-28-5	15,702	2.4E+01	1.33E+00
2,4-Dinitrotoluene	121-14-2	7,811	5.4E+00	4.60E-01
2,6-Dinitrotoluene	606-20-2	14,199	9.8E+00	4.60E-01
2-Butanone	78-93-3	51,377	1.2E+01	4.11E-01
2-Chloronaphthalene	91-58-7	7,811	5.4E+00	4.60E-01
2-Chlorophenol	95-57-8	14,199	8.6E+00	4.60E-01
2-Hexanone	591-78-6	33,153	1.3E+00	4.1OE-02
2-Methylnaphthalene	91-57-6	23,155	2.4E+02	1.03E+01
2-Methylphenol	95-48-7	29,543	9.8E+00	4.60E-01
2-Nitroaniline	88-74-4	7,811	1.3E+01	1.10E+00
2-Nitrophenol	88-75-5	14,199	8.6E+00	4.60E-01
3,3'-Dichlorobenzidine	91-94-1	7,811	5.4E+00	4.60E-01
3-Methyl Butanal	590-86-3	8,494	1.1E-01	8.30E-03
3-Nitroaniline	99-09-2	7,811	1.3E+01	1.10E+00

Table 3-2. (continued).

Contaminant	CAS Number	Contaminated Soil (m^3)	Contaminant Mass (kg)	Maximum Concentration[a] (mg/kg)
4,6-Dinitro-2-methylphenol	534-52-1	14,199	2.1E+01	1.10E+00
4-Bromophenyl-phenylether	101-55-3	7,811	5.4E+00	4.60E-01
4-Chloro-3-methylphenol	59-50-7	14,199	8.6E+00	4.60E-01
4-Chloroaniline	106-47-8	16,256	1.9E+01	1.10E+00
4-Chlorophenyl-phenylether	7005-72-3	7,811	5.4E+00	4.60E-01
4-Methyl-2-Pentanone	108-10-1	225,513	1.4E+01	1.00E-01
4-Methylphenol	106-44-5	22,644	1.8E+01	7.60E-01
4-Nitroaniline	100-01-6	7,811	1.3E+01	1.10E+00
4-Nitrophenol	100-02-7	22,644	2.4E+01	1.10E+00
Acenaphthene	83-32-9	109,970	9.6E+01	2.60E+00
Acenaphthylene	208-96-8	14,199	9.8E+00	4.60E-01
Acetone	67-64-1	243,367	2.9E+02	4.20E+00
Acetonitrile	75-05-8	54	8.9E-03	1.10E-01
Acrolein	107-02-8	54	4.3E-03	5.30E-02
Acrylonitrile	107-13-1	54	4.3E-03	5.30E-02
Anthracene	120-12-7	185,860	1.5E+02	5.30E+00
Aramite	140-57-8	54	5.4E-02	6.70E-01
Aroclor-1016	12674-11-2	6,388	3.6E+00	3.80E-01
Aroclor-1254	11097-69-1	96,545	6.1E+01	2.80E+00
Aroclor-1260	11096-82-5	100,155	3.4E+02	2.30E+01
Aroclor-1268	11100-14-4	16,439	2.9E+01	1.23E+00
Benzene	71-43-2	208,328	2.9E+02	9.34E-01
Benzidine	92-87-5	54	1.4E-01	1.70E+00
Benzo(a)anthracene	56-55-3	194,359	1.2E+02	1.50E+00
Benzo(a)pyrene	50-32-8	93,650	5.0E+01	4.60E-01
Benzo(b)fluoranthene	205-99-2	100,640	8.5E+01	2.00E+00
Benzo(g,h,i)perylene	191-24-2	7,811	5.4E+00	4.60E-01
Benzo(k)fluoranthene	207-08-9	16,256	8.8E+00	4.60E-01
Benzoic acid	65-85-0	8,445	4.1E+00	3.20E-01
bis(2-Chloroethoxy)methane	111-91-1	7,811	5.4E+00	4.60E-01
bis(2-Chloroethyl)ether	111-44-4	7,811	5.4E+00	4.60E-01
bis(2-Chloroisopropyl)ether	108-60-1	7,811	5.4E+00	4.60E-01

Table 3-2. (continued).

Contaminant	CAS Number	Contaminated Soil (m^3)	Contaminant Mass (kg)	Maximum Concentration[a] (mg/kg)
bis(2-Ethylhexyl)phthalate	117-81-7	115,622	7.0E+01	1.70E+00
Butane,1,1,3,4-Tetrachloro-	Not Defined	6,388	3.7E+00	3.90E-01
Butylbenzylphthalate	85-68-7	16,359	3.2E+01	2.10E+00
Carbazole	86-74-8	38,091	1.5E+01	4.60E-01
Carbon Disulfide	75-15-0	208,328	2.2E+01	1.40E-01
Chlorobenzene	108-90-7	8,494	3.1E+00	2.44E-01
Chloroethane	75-00-3	68	1.4E-03	1.40E-02
Chloromethane	74-87-3	16,305	1.7E-01	1.10E-02
Chrysene	218-01-9	194,359	1.3E+02	1.60E+00
Decane, 3,4-Dimethyl	173-124-57	8,494	7.6E-02	6.00E-03
Diacetone alcohol	123-42-2	6,388	2.0E+03	2.14E+02
Dibenz(a,h)anthracene	53-70-3	7,811	5.4E+00	4.60E-01
Dibenzofuran	132-64-9	31,650	1.5E+02	4.50E+00
Diethylphthalate	84-66-2	7,865	5.4E+00	4.60E-01
Dimethyl Disulfide	624-92-0	8,494	1.4E+00	1.10E-01
Dimethylphthalate	131-11-3	7,811	5.4E+00	4.60E-01
Di-n-butylphthalate	84-74-2	42,267	1.1E+01	4.50E+00
Di-n-octylphthalate	117-84-0	22,698	1.2E+01	4.60E-01
Eicosane	112-95-8	6,388	1.3E+00	1.40E-01
Ethyl cyanide	107-12-0	54	8.9E-03	1.10E-01
Ethylbenzene	100-41-4	31,704	3.7E+01	1.27E+00
Famphur	52-85-7	54	2.8E-02	3.40E-01
Fluoranthene	206-44-0	194,359	3.6E+02	6.90E+00
Fluorene	86-73-7	109,970	8.7E+01	4.90E+00
Heptadecane, 2,6,10,15-Tetra	Not Defined	6,388	1.6E+00	1.70E-01
Hexachlorobenzene	118-74-1	7,811	5.4E+00	4.60E-01
Hexachlorobutadiene	87-68-3	14,199	9.8E+00	4.60E-01
Hexachlorocyclopentadiene	77-47-4	7,811	5.4E+00	4.60E-01
Hexachloroethane	67-72-1	7,811	5.4E+00	4.60E-01
Indeno(1,2,3-cd)pyrene	193-39-5	7,811	5.4E+00	4.60E-01
Isobutyl alcohol	78-83-1	54	8.9E-03	1.10E-01
Isophorone	78-59-1	7,865	5.4E+00	4.60E-01

Table 3-2. (continued).

Contaminant	CAS Number	Contaminated Soil (m^3)	Contaminant Mass (kg)	Maximum Concentration[a] (mg/kg)
Isopropyl Alcohol/2-propanol	67-63-0	9,572	1.0E+00	7.00E-02
Kepone	143-50-0	78,320	4.7E+01	4.00E-01
Mesityl oxide	141-79-7	6,388	4.0E+01	4.19E+00
Methyl Acetate	79-20-9	8,494	2.3E-01	1.80E-02
Methylene Chloride	75-09-2	204,802	4.0E+01	2.90E-01
Naphthalene	91-20-3	31,601	2.0E+02	7.80E+00
Nitrobenzene	98-95-3	7,811	5.4E+00	4.60E-01
N-Nitroso-di-n-propylamine	621-64-7	7,811	5.4E+00	4.60E-01
N-Nitrosodiphenylamine	86-30-6	7,811	5.4E+00	4.60E-01
Octane,2,3,7-Trimethyl-	62016-34-6	8,494	7.6E-02	6.00E-03
o-Toluenesulfonamide	88-19-7	6,388	2.4E+00	2.50E-01
Pentachlorophenol	87-86-5	31,138	2.6E+01	1.10E+00
Phenanthrene	85-01-8	194,360	5.5E+02	1.60E+01
Phenol	108-95-2	22,698	3.8E+01	2.30E+00
Phenol,2,6-Bis(1,1-Dimethyl)	Not Defined	6,388	1.9E+00	2.00E-01
p-Toluenesulfonamide	70-55-3	6,388	2.4E+00	2.50E-01
Pyrene	129-00-0	103,124	1.2E+02	6.40E+00
Styrene	100-42-5	54	4.9E-04	6.00E-03
Tetrachloroethene	127-18-4	224,494	4.6E+00	1.30E-01
Toluene	108-88-3	239,746	4.7E+02	8.33E+00
Tributylphosphate	126-73-8	249,578	1.7E+02	4.60E-01
Trichloroethene	79-01-6	227,010	3.4E+01	2.00E-01
Undecane,4,6-Dimethyl-	17312822	8,494	7.6E-02	6.00E-03
Xylene (ortho)	95-47-6	245,243	1.8E+00	5.00E-03
Xylene (total)	1330-20-7	231,537	1.6E+03	4.30E+01
Ytterbium	7440-64-4	42,164	9.2E+04	4.00E+03

a. Maximum concentration identified in the CWID report (DOE-ID 2000).

For release sites where organic compounds may be present based on process knowledge, but analytical data are not available, an estimated concentration was determined using data from the CWID report. The concentrations were estimated using the weighted average of the mean concentrations from the release sites having detectable concentrations for a given organic compound. Sites where the concentrations of organic compounds were estimated using this method are shaded gray in Tables B-1 and B-2.

The majority of the data used to determine the organic compounds to be disposed in the ICDF landfill was taken from the CWID report. Additional sources, however, were used in determining the design inventory. These additional data sources include the following:

- The organic compounds that may be present in the waste from the WAG 3 sites near the tank farm were identified from *A Regulatory Analysis and Reassessment of U.S. Environmental Protection Agency (EPA) Listed Hazardous Waste Numbers for Applicability to the INTEC Liquid Waste System – WAG 3* (INEEL 1999). The organic compounds listed in Table 4 of the Regulatory Analysis report were included in Table B-1 as potentially being present based on process knowledge. Four of the organic compounds identified in Table 4 (cyclohexane, cyclohexanone, ethyl acetate, and methanol) were not included in Table B-1 because these compounds have never been detected in the soil at the INEEL.

- Data for site TSF-03 were taken from *Preliminary Scoping Track 2 Summary Report for Operable Unit 1-03* (Meyer et al. 1993).

- Data for site TSF-06 were taken from *Comprehensive Remedial Investigation/Feasibility Study for the Test Area North Operable Unit 1-10 at the Idaho National Engineering and Environmental Laboratory* (DOE-ID 1997).

3.2 Inorganic Contaminants

The inorganic contaminants expected to be present in the waste disposed to the ICDF landfill were identified in Table 5-4, Summary table of inorganic contaminant concentrations, from the CWID report. This table represents the complete list of inorganic contaminants that have been detected from any of the release sites destined for disposal in the ICDF landfill. Since the analytical methods are typically selected based on process knowledge from a given release site, this list of inorganic contaminants is a reasonable estimate of the inorganic contaminants that may be present in the waste to be disposed in the ICDF landfill.

The inorganic contaminants expected to be in the waste are identified in Table 3-3. For each contaminant, the estimated volume of contaminated soil (in cubic meters) and the contaminant mass (in kilograms) for that volume are also given.

Appendix C gives more details on the inorganic contaminants on a site-by-site basis. Details concerning inorganic contaminant concentration and mass are provided in Tables C-1 and C-2, respectively. In this appendix, when analytical data are available for a given contaminant, either the maximum concentration (identified in the CWID report) or the 95% UCL concentration (if greater than seven detectable measurements are available) was used in the design inventory for that contaminant. The sites and associated inorganic contaminants having sufficient data to calculate the 95% UCL concentration are identified in Table C-3. If an inorganic contaminant was analyzed, but not detected at a given release site, the concentration was identified as "0" in the design inventory. If the inorganic

Table 3-3. Contaminant summary table – inorganic contaminants.

Contaminant	CAS Number	Contaminated Soil (m^3)	Contaminant Mass (kg)	Maximum Concentration[a] (mg/kg)
Aluminum	7429-90-5	278,436	3.4E+06	6.53E+04
Antimony	7440-36-0	75,353	2.8E+03	1.71E+02
Arsenic	7440-38-2	261,562	2.7E+03	4.92E+01
Barium	7440-39-3	260,447	8.5E+04	9.74E+03
Beryllium	7440-41-7	173,589	1.4E+02	1.80E+00
Boron	7440-42-8	256,177	8.7E+04	4.19E+02
Cadmium	7440-43-9	275,081	1.7E+03	2.67E+01
Calcium	7440-70-2	264,122	9.7E+06	1.33E+05
Chloride	16887-00-6	256,146	8.8E+02	4.00E+00
Chromium	7440-47-3	260,785	1.9E+04	1.54E+03
Cobalt	7440-48-4	264,122	2.9E+03	1.04E+02
Copper	7440-50-8	264,122	1.4E+04	3.20E+02
Cyanide	57-12-5	42,390	1.6E+02	3.40E+00
Dysprosium	7429-91-6	42,164	2.8E+04	1.21E+03
Fluoride	16984-48-8	256,177	1.8E+03	2.64E+02
Iron	7439-89-6	264,122	4.9E+06	3.37E+04
Lead	7439-92-1	264,122	2.7E+04	2.82E+03
Magnesium	7439-95-4	264,122	2.1E+06	3.04E+04
Manganese	7439-96-5	264,122	9.8E+04	1.40E+03
Mercury	7439-97-6	260,785	4.5E+03	7.38E+01
Molybdenum	7439-98-7	256,177	4.8E+03	2.27E+01
Nickel	7440-02-0	264,122	9.3E+03	3.44E+02
Nitrate	7697-37-2	262,565	1.9E+03	3.30E+03
Nitrate/Nitrite-N	7727-37-9	2,265	1.1E+02	3.38E+01
Nitrite	14797-65-0	9,572	4.0E+00	2.80E-01
Phosphorus	7723-14-0	42,164	4.6E+04	8.98E+02
Potassium	7440-09-7	264,122	5.3E+05	3.91E+03
Selenium	7782-49-2	257,937	4.0E+02	1.01E+01
Silver	7440-22-4	217,607	4.7E+03	2.95E+02
Sodium	7440-23-5	264,122	1.0E+05	1.24E+03
Strontium	7440-24-6	42,164	8.6E+03	3.30E+02
Sulfate	14808-79-8	256,177	9.7E+03	6.40E+01

Table 3-3. (continued).

Contaminant	CAS Number	Contaminated Soil (m^3)	Contaminant Mass (kg)	Maximum Concentration[a] (mg/kg)
Sulfide	18496-25-8	29,407	3.6E+05	2.80E+04
Terbium	7440-27-9	42,164	2.7E+05	1.18E+04
Thallium	7440-28-0	134,041	1.8E+02	8.42E+01
Vanadium	7440-62-2	264,122	1.0E+04	1.04E+02
Zinc	7440-66-6	173,582	9.9E+04	6.09E+03
Zirconium	7440-67-7	262,565	3.3E+04	2.00E+02

a. Maximum concentration identified in the CWID report (DOE-ID 2000).

contaminant was not expected to be present at a given release site based on process knowledge and analytical data are not available, then the cell was not shaded and no concentration data provided. Sites where analytical data are available, either in the CWID or a referenced document, are shaded blue in Tables C-1 and C-2.

For release sites potentially contaminated with inorganic contaminants based on process knowledge, but analytical data are not available, estimated concentrations for the inorganic contaminants were determined using one of the following three methods:

- The concentration of inorganic contaminants for a release site having no data was assumed to be the same as the inorganic contamination from a similar release site where data are available. This method was applied to the following sites: (1) CPP-69 was assumed to be similar to CPP-11, (2) CPP-98 and CPP-99 were assumed to be similar to CPP-97, and (3) TSF-06 was assumed to be similar to TSF-26. The rationale for this approach to be representative of the contaminants at these sites is provided in Table 3-4. The sites where the inorganic contaminants were estimated using this method are shaded gray in Tables C-1 and C-2.

- The concentrations of inorganic contaminants from the tank farm IDW, identified as TF CPP-28 IDW and TF CPP-31 IDW, were calculated from data contained in Appendix A of the CWID report (DOE-ID 2000). The nonradionuclide inventories from Tables 1 and 6 (Appendix A of the CWID report) were used to estimate the amount of inorganic contaminants potentially present at sites CPP-31 and CPP-28, respectively. The contaminant masses were then divided by estimated volumes provided in Appendix A of the CWID report (2,790 yd^3 [2,140 m^3] for CPP-31 and 3,250 yd^3 [2,490 m^3] for CPP-28) to derive the concentrations identified in Table C-1. The sites where the inorganic contaminants were estimated using this method are shaded gray in Tables C-1 and C-2.

- For the remaining sites, the concentrations of inorganic contaminants were estimated using the weighted average of the mean concentrations from the release sites having detectable concentrations for the given inorganic contaminants. Sites where inorganic contaminants are estimated using this method are shaded gray in Tables C-1 and C-2.

Table 3-4. Rationale for the selection of corresponding sites for CPP-69. CPP-98. CPP-99. and TSF-06.

Original Site	Corresponding Site	Rationale
CPP-69: This site consists of an abandoned liquid radioactive waste storage tank (SFE-20) and its contents; the tank was taken out of service in 1977. The tank contains approximately 1,514 L (400 gal) of low-level radioactive waste. The soils underneath the tank have not been sampled due to inaccessibility. There is no evidence that the vault has leaked and contaminated the underlying soils.	CPP-11: In February 1978, approximately 1,136 to 1,893 L (300 to 500 gal) of sludge and water was released from CPP-603 to the soil above the tank SFE-106. The initial spill was cleaned up and soils with radiation levels greater than 1 Whr were removed. The soil was sampled during the CERCLA investigation and identified the following contaminants of potential concern: arsenic, thorium, Co-60, Sr-90, Cs-137, Eu-154, and Np-237.	No sampling data are available for the soil beneath the SFE-20 tank vault (i.e., part of site CPP-69). There is also no indication that this soil has been contaminated. If contamination were to exist, however, it is assumed to be similar to that from CPP-11 since both sites are from a similar waste stream. Therefore, the soil data from site CPP-11 are assumed to be representative of the CPP-69 soil contamination for design inventory purposes.
CPP-98: The tank farm upgrade project used wooden shoring during excavation. Because the soil was contaminated, the shoring also became contaminated. The contaminated shoring was placed into 118 wooden radioactive boxes that have been managed as low-level radioactive waste.	CPP-97: This site consists of two tarp-covered stockpiles that originated from the tank farm upgrade project. One pile contains approximately 1,093 m^3 (1,430 yd^3) of radionuclide-contaminated soils. Radiation measurements at the time of generation ranged between 0 and 3 mR/hr. The second stockpile contains approximately 53 m^3 (70 yd^3) of radionuclide-contaminated soils with 3 to 50 mR/hr radiation readings.	No analytical data are available for the contaminated wooden shoring used during the tank farm upgrade project. Data are available for the corresponding contaminated soils that were excavated as part of the same project. In addition, these soils were not returned to the excavation because they were determined contaminated based on field instruments. Therefore, the soil data from site CPP-97 are assumed representative of site CPP-98 for design inventory purposes.
CPP-99: In addition to sites CPP-97 and CPP-98, this site consists of 59 wooden boxes of radionuclide-contaminated soil generated from the tank farm upgrade and CPP-604 tunnel egress projects.	CPP-97: This site consists of two tarp-covered stockpiles that originated from the tank farm upgrade project. One pile contains approximately 1,093 m^3 (1,430 yd^3) of radionuclide-contaminated soils. Radiation measurements at the time of generation ranged between 0 and 3 mR/hr. The second stockpile contains approximately 53 m^3 (70 yd^3) of radionuclide-contaminated soils with 3 to 50 mR/hr radiation readings.	No analytical data are available for the contaminated soil in the 59 wooden boxes excavated during the tank farm upgrade and CPP-604 tunnel egress projects. Data are available for similar contaminated soils that were excavated as part of the tank farm upgrade project. In addition, these soils were not returned to the excavation because they were determined contaminated based on field instruments. Therefore, the soil data from site CPP-97 are assumed representative of site CPP-99 for design inventory purposes.
TSF-06: This site is the Soil Contamination Area where surface soils were radioactively contaminated by the wind-blown deposition of contaminated soils at the PM-2A Tanks (TSF-26), located south of TSF-06. Primary contaminants known or suspected to be in the soils are based on the process knowledge from the operation and sampling of waste from the PM-2A Tanks.	TSF-26: This site, known as the PM-2A Tanks, consists of the contaminated surface soil surrounding the two abandoned underground storage tanks. The soil above the tanks was contaminated by spills containing radionuclides and hazardous constituents, including Cs-137, when waste was transferred to the tanks.	Based on process knowledge, the source of contamination for both sites is the same, originating from the PM-2A Tanks. TSF-26 is the source of contamination and TSF-06 is the corresponding wind-blown area of contamination. From the 2000 sampling results, the contaminant concentrations from site TSF-26 are higher than the corresponding concentrations from site TSF-06. Therefore, the soil data from site TSF-26 are assumed to be representative of site TSF-06 for the desinn inventorv.

In addition to the data in the CWID report, additional data for sites TSF-03, TSF-07, and TSF-09/18 were taken from DOE-ID (1997).

3.3 Radionuclides

The CWID provides the available analytical data for the radiological contaminants that have been analyzed for each release site. Specifically, it contains analytical data on the following radionuclides that have been detected at one or more release sites at the INEEL:

Ag-108m, Am-241, Ce-144, Co-57, Co-60, Cs-134, Cs-137, Eu-152, Eu-154, Eu-155, I-129, K-40, Np-237, Pu-238, Pu-239, Pu-239/240, Ra-226, Ru-106, Sb-125, Sr-90, Tc-99, Th-228, Th-230, Th-232, H-3, U-234, U-235, U-238

Based upon typical reactor operations, however, it is likely that other radionuclides may be present in the waste stream (DOE-ID 1997). To estimate the concentration of the potentially present radionuclides at a given release site, a scaling factor was developed based on Cs-137 concentrations and the irradiation of a typical 200-g fuel element. This approach will identify the radionuclides that were potentially present in the waste stream and estimate their concentrations relative to the Cs-137 concentration. It will not account for naturally occurring radionuclides such as uranium, thorium, etc. and their daughter products.

Cs-137 was selected as the indicator radionuclide for the scaling because (1) the majority of the sites have data on Cs-137 and (2) it is a relatively immobile contaminant in nature and should still be present in the waste volume. An evaluation showed the CWID report and other referenced documents contained analytical data for Cs-137 on all but three sites. The Cs-137 concentrations at these three sites (CPP-69, CPP-98, and CPP-99) were estimated based upon the Cs-137 concentrations at similar release sites. Site CPP-69 was assumed to be the same as site CPP-11 and sites CPP-98 and CPP-99 were assumed to be the same at CPP-97. In addition, radiological contamination was not expected at sites CPP-44, CPP-55, CPP-93, and TSF-03; and as a result, Cs-137 data are not available. For these sites, a background concentration of 0.82 pCi/g was used for Cs-137 in the design inventory.

The Cs-137 concentrations used in the design inventory were determined following the approach described in the methodology section. Either the maximum concentration or the 95% UCL concentration (if eight or more detectable measurements are available) was used in the design inventory for Cs-137. The concentrations for the other radionuclides where analytical data are not available were determined using a scaling factor based upon the site-specific Cs-137 concentration.

The development of scaling factors for each radionuclide is described in Appendix A-2, Estimated Chemical and Radionuclide Constituents in INTEC Tank Farm Non-High Level Liquid Waste, of the CWID report. Basically, the computer-modeled activities from a typical 200-g fuel element following irradiation were used to determine the scaling factors necessary to estimate the activities of the other radionuclides based upon the Cs-137 concentration. The theoretical activities of the waste from a typical reactor operation are identified in Table A-1a, Appendix A-2 of the CWID report. These activities, identified in Table A-1a, Appendix A-2 of the CWID report, were then adjusted to account for 22 years of radioactive decay from the time period of 1980 to January 1, 2002. The radioactive decay was performed using the Radioactive Decay Calculator® (Version 2.01), which accounts for all daughter products and ingrowth radionuclides. The resulting activities calculated for January 1, 2002, were then divided by the Cs-137 activity to develop a specific scaling factor for each radionuclide. The scaling factors for each radionuclide are provided in Table D-1 of Appendix D.

A summary of the design inventory for radionuclides is provided in Table 3-5. This table lists all radionuclide contaminants in the design inventory, the volume of contaminated soil (in cubic meters), and the estimated activity for each radionuclide. The volume of contaminated soil includes all release sites except CPP-44, CPP-55, CPP-93, and TSF-03, where radiological contamination is not expected based on process knowledge.

Table 3-5. Contaminant summary table - radionuclide contaminants.[a]

Radionuclide	Half-life	Contaminated Soil Volume (m^3)[b]	Activity (Ci) (1/1/2002)	Activity (Ci) (1/1/3002)	Radionuclide	Half-life	Contaminated Volume Soil (m^3)[b]	Activity (Ci) (1/1/2002)	Activity (Ci) (1/1/3002)
H-3	1.23E+01	312,598	2.3E+01	7.1E-24	Rh-106	9.51E-07	312,598	5.4E-03	2.3E-106
Be-10	1.60E+06	312,598	5.4E-07	5.4E-07	Ag-106	4.56E-05	312,598	0.0E+00	0.0E+00
C-14	5.73E+03	312,598	2.2E-05	1.9E-05	Pd-107	6.50E+06	312,598	2.9E-03	2.9E-03
K-40	1.28E+09	312,598	9.1E-01	9.1E-01	Ag-108	4.51E-06	312,598	1.8E-09	1.5E-04
Sc-46	2.30E-01	312,598	1.3E-20	0.0E+00	**Ag-108m**	1.27E+02	312,598	3.8E-01	1.6E-03
Cr-51	7.39E-02	312,598	1.1E-54	0.0E+00	Ag-109m	1.25E-06	312,598	2.3E-12	9.0E-116
Mn-54	8.56E-01	312,598	9.1E-09	0.0E+00	Cd-109	1.27E+00	312,598	2.3E-12	0.0E+00
Co-57	7.42E-01	312,598	1.7E-03	0.0E+00	Ag-110	7.79E-07	312,598	2.5E-11	1.3E-114
Co-58	1.94E-01	312,598	2.8E-17	0.0E+00	Ag-110m	6.84E-01	312,598	2.6E-09	0.0E+00
Fe-59	1.22E-01	312,598	2.1E-35	0.0E+00	Ag-111	2.04E-02	312,598	0.0E+00	0.0E+00
Co-60	5.27E+00	312,598	9.2E+01	7.3E-56	Cd-113m	1.37E+01	312,598	7.7E-01	8.3E-23
Zn-65	6.69E-01	312,598	1.3E-09	0.0E+00	In-114	2.28E-06	312,598	8.9E-55	3.5E-158
Se-79	6.50E+04	312,598	7.9E-02	7.8E-02	In-114m	1.36E-01	312,598	9.4E-55	0.0E+00
Kr-81	2.10E+05	312,598	2.5E-09	2.5E-09	Cd-115m	1.22E-01	312,598	2.0E-54	0.0E+00
Kr-85	1.07E+01	312,598	5.5E+02	4.6E-26	In-115	4.60E+15	312,598	2.7E-12	2.7E-12
Rb-86	5.11E-02	312,598	0.0E+00	0.0E+00	In-115m	5.12E-04	312,598	0.0E+00	0.0E+00
Rb-87	4.73E+10	312,598	5.3E-06	5.3E-06	Sn-117m	3.72E-02	312,598	0.0E+00	0.0E+00
Sr-89	1.38E-01	312,598	2.8E-44	0.0E+00	Sn-119m	8.02E-01	312,598	7.0E-08	0.0E+00
Sr-90	2.86E+01	312,598	1.1E+04	3.3E-07	Sn-121m	7.60E+01	312,598	1.3E-02	1.4E-06
Y-90	7.31E-03	312,598	1.1E+04	3.3E-07	Sn-123	3.54E-01	312,598	4.0E-17	0.0E+00
Y-91	1.60E-01	312,598	2.0E-37	0.0E+00	Te-123	1.00E+13	312,598	2.1E-15	2.1E-15
Nb-92	3.60E+07	312,598	3.0E-19	3.0E-19	Te-123m	3.28E-01	312,598	1.4E-23	0.0E+00
Zr-93	1.53E+06	312,598	4.1E-01	4.1E-01	Sb-124	1.65E-01	312,598	9.8E-41	0.0E+00
Nb-93m	1.46E+01	312,598	6.4E-03	4.1E-01	Sn-125	2.64E-02	312,598	0.0E+00	0.0E+00
Nb-94	2.03E+04	312,598	4.2E-06	4.1E-06	**Sb-125**	2.77E+00	312,598	4.4E+00	0.0E+00
Zr-95	1.75E-01	312,598	1.4E-25	0.0E+00	Te-125m	1.59E-01	312,598	1.1E+00	4.2E-104
Nb-95	9.60E-02	312,598	2.3E-33	1.3E-128	Sn-126	1.00E+05	312,598	7.0E-02	7.0E-02
Nb-95m	9.88E-03	312,598	8.7E-36	4.6E-131	Sb-126	1.24E+01	312,598	9.8E-03	7.0E-02
Tc-98	4.20E+06	312,598	8.4E-08	8.4E-08	Sb-126m	3.61E-05	312,598	7.0E-02	9.7E-03
Tc-99	2.13E+05	312,598	2.7E+00	2.7E+00	Te-127	1.07E-03	312,598	4.4E-20	1.7E-123
Rh-102	2.90E+00	312,598	1.4E-05	2.2E-109	Te-127m	2.98E-01	312,598	4.5E-20	0.0E+00
Ru-103	1.08E-01	312,598	9.5E-30	0.0E+00	Xe-127	9.97E-02	312,598	7.5E-73	0.0E+00
Rh-103m	1.07E-04	312,598	1.3E-58	3.7E-133	Te-129	1.32E-04	312,598	3.2E-71	1.3E-174
Ru-106	1.01E+00	312,598	5.8E-03	0.0E+00	Te-129m	9.20E-02	312,598	5.1E-71	0.0E+00

Table 3-5. (continued).

Radionuclide	Half-life	Contaminated Soil Volume (m^3)[b]	Activity (Ci) (1/1/2002)	Activity (Ci) (1/1/3002)	Radionuclide	Half-life	Contaminated Volume Soil (m^3)[b]	Activity (Ci) (1/1/2002)	Activity (Ci) (1/1/3002)
1-129	1.57E+07	312,598	6.1E-01	6.1E-01	**Eu-155**	4.96E+00	312,598	8.4E+01	1.8E-59
Xe-129m	2.43E-02	312,598	0.0E+00	0.0E+00	Eu-156	4.16E-02	312,598	0.0E+00	0.0E+00
1-131	2.20E-02	312,598	0.0E+00	0.0E+00	Tb-160	1.98E-01	312,598	1.5E-34	0.0E+00
Xe-131m	3.24E-02	312,598	1.3E-112	0.0E+00	Tb-161	1.89E-02	312,598	0.0E+00	0.0E+00
Cs-132	1.77E-02	312,598	0.0E+00	0.0E+00	Ho-166m	1.20E+03	312,598	1.3E-06	7.3E-07
Xe-133	1.44E-02	312,598	0.0E+00	0.0E+00	Er-169	2.57E-02	312,598	0.0E+00	0.0E+00
Cs-134	2.06E+00	312,598	5.3E+00	0.0E+00	Tm-170	3.52E-01	312,598	3.0E-26	0.0E+00
Cs-135	2.30E+06	312,598	1.7E-02	1.7E-02	Tm-171	1.92E+00	312,598	7.6E-13	0.0E+00
Cs-136	3.60E-02	312,598	0.0E+00	0.0E+00	Hf-181	1.16E-01	312,598	3.7E-37	0.0E+00
Ba-136m	1.01E-08	312,598	0.0E+00	0.0E+00	TI-207	9.07E-06	312,598	8.7E-06	1.3E-05
Cs-137	3.02E+01	312,598	1.2E+04	1.3E-06	TI-208	5.80E-06	312,598	9.4E-05	2.7E-02
Ba-137m	4.85E-06	312,598	1.1E+04	1.2E-06	TI-209	4.18E-06	312,598	5.0E-10	1.3E-06
La-138	stable	312,598	0.0E+00	0.0E+00	Pb-209	3.71E-04	312,598	2.3E-08	6.1E-05
Ba-140	3.50E-02	312,598	0.0E+00	0.0E+00	Pb-210	2.23E+01	312,598	5.2E-07	1.8E-01
La-140	4.59E-03	312,598	1.3E-105	0.0E+00	Pb-211	6.86E-05	312,598	8.7E-06	9.6E-04
Ce-141	8.90E-02	312,598	8.5E-72	0.0E+00	Pb-212	1.21E-03	312,598	2.6E-04	7.4E-02
Ce-142	stable	312,598	0.0E+00	0.0E+00	Pb-214	5.10E-05	312,598	2.7E-06	1.8E-01
Pr-143	3.71E-02	312,598	0.0E+00	0.0E+00	Bi-210	1.37E-02	312,598	5.2E-07	1.8E-01
Ce-144	7.78E-01	312,598	8.6E-04	0.0E+00	Bi-211	4.05E-06	312,598	8.7E-06	9.6E-04
Pr-144	3.29E-05	312,598	8.4E-04	3.4E-107	Bi-212	1.15E-04	312,598	2.6E-04	7.4E-02
Pr-144m	1.37E-05	312,598	1.2E-05	4.8E-109	Bi-213	8.68E-05	312,598	0.0E+00	6.1E-05
Nd-144	5.00E+15	312,598	1.5E-10	1.5E-10	Bi-214	3.78E-05	312,598	2.7E-06	1.8E-01
Pm-146	5.53E+00	312,598	2.8E-03	1.1E-57	Po-210	3.79E-01	312,598	4.8E-07	1.8E-01
Sm-146	7.00E+07	312,598	2.0E-10	2.0E-10	Po-211	1.64E-08	312,598	3.2E-10	5.8E-22
Nd-147	3.01E-02	312,598	0.0E+00	0.0E+00	Po-212	9.44E-15	312,598	1.6E-04	1.0E-18
Pm-147	2.62E+00	312,598	1.8E+02	0.0E+00	Po-213	1.33E-13	312,598	2.1E-08	5.8E-05
Sm-147	1.06E+11	312,598	1.9E-06	1.9E-06	Po-214	5.20E-12	312,598	2.7E-06	1.8E-01
Pm-148	1.47E-02	312,598	1.9E-59	7.3E-163	Po-215	6.34E-11	312,598	8.7E-06	9.6E-04
Pm-148m	1.13E-01	312,598	3.9E-58	0.0E+00	Po-216	4.63E-09	312,598	2.6E-04	7.4E-02
Sm-148	1.20E+13	312,598	4.8E-13	4.8E-13	Po-218	5.80E-06	312,598	2.7E-06	1.8E-01
Sm-149	4.00E+14	312,598	2.4E-12	2.4E-12	At-217	1.01E-09	312,598	2.4E-08	6.1E-05
Eu-150	5.00E+00	312,598	8.2E-09	5.1E-69	Rn-218	1.11E-09	312,598	6.0E-117	2.2E-220
Sm-151	9.00E+01	312,598	1.6E+02	7.2E-02	Rn-219	1.25E-07	312,598	9.6E-06	9.6E-04
Eu-152	1.36E+01	312,598	4.6E+02	3.4E-20	Rn-220	1.76E-06	312,598	2.6E-04	7.4E-02
Gd-152	1.10E+14	312,598	1.3E-14	1.6E-11	Rn-222	1.05E-02	312,598	2.9E-06	1.8E-01
Gd-153	6.61E-01	312,598	9.5E-12	0.0E+00	Fr-221	9.13E-06	312,598	2.4E-08	6.1E-05
Eu-154	8.80E+00	312,598	3.9E+02	2.5E-32	Fr-223	4.14E-05	312,598	1.3E-07	1.3E-05
Ra-222	1.20E-06	312,598	5.5E-117	4.0E-221	Np-239	6.45E-03	312,598	1.6E-04	1.5E-04
Ra-223	3.13E-02	312,598	9.6E-06	9.6E-04	Np-240	1.24E-04	312,598	1.3E-14	1.3E-14
Ra-224	9.91E-03	312,598	2.6E-04	7.4E-02	Np-240m	1.41E-05	312,598	1.2E-11	1.2E-11

Table 3-5. (continued).

Radionuclide	Half-life	Contaminated Soil Volume (m^3)[b]	Activity (Ci) (1/1/2002)	Activity (Ci) (1/1/3002)	Radionuclide	Half-life	Contaminated Volume Soil (m^3)[b]	Activity (Ci) (1/1/2002)	Activity (Ci) (1/1/3002)
Ra-225	4.05E-02	312,598	2.4E-08	6.1E-05	Pu-236	2.85E+00	312,598	2.6E-06	2.9E-09
Ra-226	1.60E+03	312,598	2.2E-01	1.8E-01	Pu-237	1.24E-01	312,598	5.7E-59	0.0E+00
Ra-228	5.75E+00	312,598	7.2E-11	7.4E-02	**Pu-238**	8.78E+01	312,598	1.1E+02	4.1E-02
Ac-225	2.74E-02	312,598	2.4E-08	6.1E-05	**Pu-239**	2.41E+04	312,598	3.2E+00	3.1E+00
Ac-227	2.18E+01	312,598	9.7E-06	9.6E-04	**Pu-240**	6.57E+03	312,598	7.1E-01	6.4E-01
Ac-228	6.99E-04	312,598	7.2E-11	7.4E-02	Pu-241	1.44E+01	312,598	3.0E+01	3.5E-08
Th-226	5.87E-05	312,598	1.0E-117	0.0E+00	Pu-242	3.76E+05	312,598	1.1E-04	1.1E-04
Th-227	5.13E-02	312,598	8.6E-06	1.6E-17	Pu-243	5.65E-04	312,598	3.0E-16	3.0E-16
Th-228	1.91E+00	312,598	1.6E-02	7.4E-02	Pu-244	8.26E+07	312,598	1.2E-11	1.2E-11
Th-229	7.34E+03	312,598	2.4E-08	6.1E-05	Pu-246	2.97E-02	312,598	6.5E-26	5.9E-26
Th-230	7.70E+04	312,598	8.2E-02	1.1E-01	**Am-241**	4.32E+02	312,598	1.1E+01	2.4E+00
Th-231	2.91E-03	312,598	7.6E-02	5.2E-02	Am-242m	1.52E+02	312,598	2.1E-05	2.2E-07
Th-232	1.40E+10	312,598	7.4E-02	7.4E-02	Am-242	1.83E-03	312,598	2.1E-05	2.2E-07
Th-234	6.60E-02	312,598	8.1E-04	9.2E-01	Am-243	7.38E+03	312,598	1.6E-04	1.5E-04
Pa-231	3.73E+04	312,598	3.3E-05	9.9E-04	Am-245	2.40E-04	312,598	0.0E+00	0.0E+00
Pa-233	7.39E-02	312,598	2.1E-02	3.0E-01	Am-246	4.75E-05	312,598	6.5E-26	5.9E-26
Pa-234m	2.22E-06	312,598	8.1E-04	9.2E-01	Cm-241	9.58E-02	312,598	6.1E-81	0.0E+00
Pa-234	7.64E-04	312,598	1.3E-06	1.5E-03	Cm-242	4.47E-01	312,598	2.6E-17	2.8E-111
U-230	5.69E-02	312,598	0.0E+00	0.0E+00	Cm-243	2.85E+01	312,598	1.7E-06	4.7E-17
U-232	7.20E+01	312,598	2.5E-04	1.9E-08	Cm-244	1.81E+01	312,598	8.5E-04	2.0E-20
U-233	1.59E+05	312,598	1.2E-05	1.3E-03	Cm-245	8.50E+03	312,598	3.8E-08	3.5E-08
U-234	2.44E+05	312,598	2.9E+00	2.9E+00	Cm-246	4.75E+03	312,598	8.5E-10	7.3E-10
U-235	7.04E+08	312,598	5.2E-02	5.2E-02	Cm-247	1.56E+07	312,598	3.0E-16	3.0E-16
U-236	2.34E+07	312,598	9.6E-02	9.6E-02	Cm-248	3.39E+05	312,598	9.3E-17	9.3E-17
U-237	1.85E-02	312,598	0.0E+00	0.0E+00	Cm-250	6.90E+03	312,598	2.6E-25	2.4E-25
U-238	4.47E+09	312,598	9.2E-01	9.2E-01	Bk-249	8.76E-01	312,598	1.0E-21	0.0E+00
U-240	1.61E-03	312,598	1.2E-11	1.2E-11	Bk-250	3.68E-04	312,598	3.7E-26	3.3E-26
Np-235	1.08E+00	312,598	3.2E-11	0.0E+00	Cf-249	3.51E+02	312,598	2.0E-16	2.8E-17
Np-236	1.15E+05	312,598	3.3E-08	3.3E-08	Cf-250	1.31E+01	312,598	1.0E-16	3.3E-26
Np-237	2.14E+06	312,598	3.0E-01	3.0E-01	Cf-251	9.00E+02	312,598	4.5E-19	2.1E-19
Np-238	5.80E-03	312,598	1.0E-07	1.1E-09	Cf-252	2.64E+00	312,598	1.1E-20	0.00+00

a. Bold indicates radionuclides that have been detected at the INEEL release sites.
b. The contaminated soil volume includes all release sites except CPP-44, CPP-55, CPP-93, and TSF-03, where radiological contamination is not expected based on process knowledge.

Appendix D identifies the design inventory for radionuclides on a site-by-site basis. Details concerning radionuclide concentration and activity are provided in Tables D-2 and D-3, respectively. Tables D-2 and D-3 use the concentrations derived from the scaling factors except when actual analytical data were available. If data were available, either the maximum concentration or the 95% UCL concentration (if eight or more detectable measurements are available) was used in the design inventory for the given radionuclide except for Sr-90, Tc-99, and U-234. For these radionuclides, the concentrations determined using the scaling factors were significantly higher than the analytical data available in measured concentrations in CWID. As a result, the design inventory used the scaled-determined concentrations for these radionuclides as a more conservative estimate. The sites and associated radionuclides having sufficient data to calculate the 95% UCL concentrations are identified in Table D-4.

4. DATA USE

The design inventory provides a conservative estimate of the type of contaminants, both concentration and mass, that are expected to be present in the wastes destined for disposal in the ICDF landfill during the first 10 years of operation. The approach used to develop the design inventory was to use the existing data to the maximum extent possible in order to provide waste characteristic estimates. When data were not available, however, conservative assumptions were used to estimate the potential contaminant characteristics of the waste for the design inventory. This is important because the design inventory is not only based on the analytical data, but also includes an evaluation of each release site to determine the type and concentration of contaminants that may be reasonably expected to be present in the waste.

The following bullets summarize the approach and assumptions used to develop the design inventory:

- All data with detectable concentrations (i.e., all data that were not flagged with a "U" qualifier) were used in development of the design inventory. This includes data with other data validation qualifiers, such as "R," "J," "B," etc.

- Contaminant estimates for the release sites having analytical data were based either on the maximum concentration (if less than eight detectable measurements were available) or the 95% UCL concentration (if eight or more detectable measurements).

- A conservative approach was used to estimate the 95% UCL concentration. The mean concentrations of the samples were determined using only the data having detectable measurements, and the standard deviation was calculated using all the data. This approach results in a conservative estimate for both the mean and standard deviation (see discussion in Appendix A).

- Contaminant estimates for the release sites without analytical data were based on the weighted-average of the mean concentrations from the sites having analytical data for that contaminant. As an additional conservative estimate, the mean concentrations were calculated using only the data having detectable measurements (i.e., no "U" flagged data used in the calculations).

- The amount of contaminant at each release site was determined by multiplying the contaminant concentration estimates (described above) by the entire soil volume identified in the CWID report. This assumes that the entire volume of soil is contaminated by a concentration equal to the maximum or 95% UCL.

- For radionuclides, concentrations for all possible contaminants were determined based upon a scaling factor applied to the site-specific Cs-137 concentrations and, when available, the analytical data. A comparison of the analytical data to the scaled data determined that the scaled data provide a reasonable estimate of the radionuclide concentration within the waste. When both analytical and scaled data were available, the more conservative (i.e., higher) concentration was used in the design inventory.

- Concentration estimates for Sr-90, Tc-99, and U-234 were based on the scaled data rather than the analytical data. For these radionuclides, the scaled data generally provide a more conservative estimate of the contaminant concentration.

Given the limited characterization data on the waste, it is not possible to quantify the differences between the contaminant concentration in the design inventory to the actual waste. Based upon the above assumptions, however, it appears that the design inventory provides a reasonably conservative estimate of the wastes to be disposed in the ICDF landfill during the first 10 years of operation.

5. REFERENCES

40 CFR 264,2000, "Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities," *Code of Federal Regulations,* Office of the Federal Register, July 2000.

40 CFR 761, 2000, "Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions," *Code of Federal Regulations,* Office of the Federal Register, July 2000.

DOE O 435.1, "Radioactive Waste Management," U.S. Department of Energy, July 9, 1999.

DOE-ID, 1997, *Comprehensive Remedial Investigation/Feasibility Study for the Test Area North Operable Unit 1-10 at the Idaho National Engineering and Environmental Laboratory,* DOEAD-10557, Rev. *0,* November 1997.

DOE-ID, 1999, *Final Record of Decision, Idaho Nuclear Technology and Engineering Center, Operable Unit 3-13, Idaho National Engineering and Environmental Laboratory, Idaho Falls, Idaho,* DOEAD-10660, Rev. 0, October 1999.

DOE-ID, 2000, *CERCLA Waste Inventory Database Report for the Operable Unit 3-13 Waste Disposal Complex,* DOE/ID-10803, Rev. *0,* December 2000.

INEEL, 1999, *A Regulatory Analysis and Reassessment of U.S. Environmental Protection Agency (EPA) Listed Hazardous Waste Numbers for Applicability to the INTEC Liquid Waste System – WAG 3,* INEEL/EXT-98-01213, Rev. 1, February 1999.

Meyer, T. J., W. A. Trippet II, K. K. Hood (Kaal), and C. A. Loehr, 1993, *Preliminary Scoping Track 2 Summary Report for Operable Unit 1-03,* EGG-ER-10554, Rev. 0, EG&G Idaho Inc., April 1993.

Radioactive Decay Calculator@,Version 2.01, Fairfield, California: ChemSW, 2000.